

POPLITEAL ARTERY ANEURYSMS: A LITERATURE REVIEW AND CASE STUDY

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Abstract:

Introduction: Popliteal artery aneurysms (PPAs) are localized and irreversible dilations of the popliteal artery walls. PPA is an uncommon condition, despite which the popliteal artery constitutes the second most frequent location for true aneurysms, second to the aorta, and is the most common location for peripheral aneurysms. It primarily affects male patients with a mean age of 65 years, its effects are mainly ischemic, and patients suffering from it require leg amputation around 7% to 20% of the times. Our goal is to present a case of PPA with subacute arterial ischemia, along with a literature review. **Case study:** we introduce the case of a 63 years old patient with lower limb pain and no pulse. He was diagnosed with developed subacute ischemia, and it was determined that the patient's condition was not stable, precluding revascularization. The patient's leg was amputated as an emergency measure. Dissecting the patient's limb revealed the presence of PPA. **Discussion:** The incidence of PPA is between 0.1% and 1%, and its clinical traits vary. Arteriography is the gold standard for its diagnosis. Surgery is the treatment of choice, but new therapeutic options are being introduced. Anatomical variations of the PA ramifications must be taken into account. **Conclusions:** We conclude that our procedure was adequate considering the state of the patient.

Keywords: popliteal artery aneurysm; case report; literature review.

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Introduction

Popliteal artery aneurysm (PPA) is an uncommon condition, despite which the popliteal artery constitutes the second most frequent location for true aneurysms after the aorta, and the first for peripheral aneurysms. It primarily affects men with a mean age of 65 years, and produces symptoms (mainly of ischemic nature) in around 60% of cases. Patients suffering from PPA require amputation with a frequency that varies between 7% and 20%, according to the literature [1-6]. PPAs are defined as transversal dilations of the popliteal artery greater than 2cm or greater than 150% of the normal artery diameter [1]. The most widely accepted etiology for PPA is atherosclerosis [2], although recently it has been proposed that inflammation might play a role [3,4].

The aim of this work was to introduce the case of a patient with PPA and subacute arterial ischemia who received treatment in our department in 2015, and to present a review of the literature on the topic (carried out using online search engines).

Methods

We performed an Internet search with the key words "Popliteal artery aneurysm", "clinical", "epidemiology", "treatment" and "approach", in Spanish and English, using Pubmed, BVS, UpToDate and Google Scholar. The patient whose case is described provided consent for the publication of anonymous data for scientific or educational ends in written form.

Case study

We introduce the case of a male patient, aged 63, who visits the medical ward of our hospital (Hospital Nacional de Clínicas) and is referred to the vascular surgery department. The patient had a history of hypertension and smoking (moderate), and had undergone inguinal hernia repair surgery. He sought attention at our hospital because he was experiencing pain on his right leg (96 hours of development, intensity 9/10), which was pale (marble white coloring) and had no distal mobility. His clinical condition was unstable, and met the criteria for systemic inflammatory response syndrome. Measures against hypovolemia were initiated. Laboratory tests revealed that the patient had 20.000 white cells, with high percentages of polymorphonuclear leucocytes (suggesting bacterial infection), a 550 CPK, 30% APP (ref 50 – 150%), 50,000 platelets, (ref 150,000 – 300,000) and KPTT 56 seconds (ref 20 –39 seconds). The patient was diagnosed with disseminated intravascular coagulation. In order to reduce clotting, the patient received a blood product transfusion. Since there was limited response to the treatment, it was decided that, once coagulation decreased, supracondylar amputation should be carried out. During surgery, the patient's limb was dissected, revealing a PPA (Figure 1). When the surgical intervention finished, the patient was sent to an intensive care unit, where an abdominal CAT scan was carried out using contrast in order to determine whether there was an abdominal aortic aneurysm, and the patient's neck and lower left limb vessels were inspected by Doppler ultrasound. Taking into account the results of all the tests, it was determined that there were no concomitant aneurysms. The state of the patient had a positive development, and it was decided that he was to be discharged from hospital and to receive follow-up care as an outpatient.



Image 1. At the tip of the clamp, there can be seen the patient's popliteal artery aneurysm, dissected coronally.

Discussion

PPA is a condition characterized by a clinical picture ranging from the absence of symptoms to chronic ischemia and acute arterial ischemia. The popliteal artery is the continuation of the superficial femoral artery, which passes through the back of the knee joint, in the deep fascia, and branches to form the leg and foot vessels. It comes out from the adductor hiatus, goes in the direction of the medial and posterior through the popliteal fossa, and ends in the popliteal muscle, where it continues on the tibial vessels. Its terminal branches are the anterior tibial artery and the tibial-fibular trunk, which branches into the posterior tibial artery and the peroneal artery. Its mean length varies between 17 and 18 centimeters [5]. (Image N°2)

Its diameter varies from 0.7cm to 1.1cm, and its mean length is around 16cm.

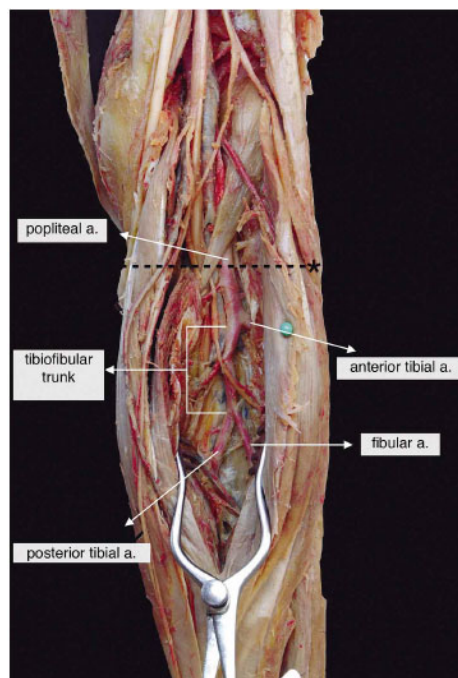


Image 2. Anatomical areas linked to the popliteal artery

Aneurysms are defined as dilations greater than 50% of the vessel diameter (in the case of the popliteal artery, greater than 1.5 cm³) [6]. Most authors agree that there is a low incidence of PPA, but they do not provide approximate frequency figures. According to Ticket et al. [7] and Henccke et al. [8] the incidence of PPA in the general population is 0.1%, and it reaches 1% in men aged between 65 and 80%. PPA primarily affects male patients between the sixth and eighth decade of life, at a mean age of 65; it is frequently associated with aneurysms affecting other arteries, and there are high rates of bilateral presentation. [1-6].

PPAs are the most common type of aneurysm among peripheral aneurysms [1, 6].

The most common complications of PPA are caused by thrombosis. A study analyzing PPAs with thrombosis specifically showed that the two main risk factors predicting thrombosis, independently of its size and shape, were arterial hypertension and bilateral presentation [1]. The same authors observed negative outcomes in those patients who experienced complications, with 66.66% morbidity, 33.33% amputations and 16.66% mortality as compared to the null morbidity and mortality observed in patients whose PPA was treated effectively.

Comorbidities are observed in 95% of patients.

Mertens et al. [9] evaluated 33 patients over a 15 year period, during which arterial hypertension was the associated condition with the highest prevalence (71.4%), followed by smoking (42.9%) and coronary disease (33.3%). Rojas-Reyna et al. [1] observed higher figures: 90.9% of patients smoked, and 63.6% suffered arterial hypertension. Both risk factors were present in our patient.

While Mertens [9] found a 57.1% prevalence of associated aneurysm for bilateral presentations of PPA, 57.1% for femoral aneurysms, 47.6% for aortic aneurysms, and 23.8% for iliac aneurysms, Rojas-Reyna et al. (N=11) found that out of the 63.63% of the patients who presented with bilateral PPA, 54.54% also presented with abdominal aortic aneurysm. In our case, we determined the absence of abdominal aortic aneurysm by performing a TC scan with contrast (figure 3).

PPAs present varying clinical pictures: patients might exhibit acute or chronic symptoms of occlusion, due to thrombosis or embolism or popliteal sciatic nerve compression symptoms, or might exhibit no symptoms at all in up to 40% of cases [6–14]:

Diagnosis is performed based on clinical manifestations and complementary methods, and authors differ as to which method is best. Color Doppler ultrasound scans are a valid, sensitive, low-cost, non-invasive option [10]. According to other authors, magnetic resonance and magnetic resonance angiography are even superior to arteriography [11], while others such as Imigo et al. [6] consider arteriography to be the gold standard (see figure 4 and 5).



Image 3.

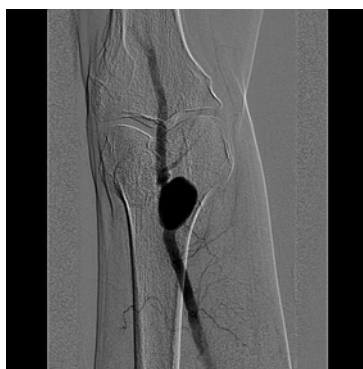


Image 4.

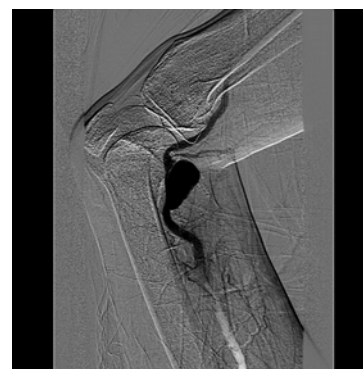


Image 5.

Early surgical intervention is the therapeutic option of choice even for asymptomatic patients [11]. Options include conventional surgery accompanied by the placing of an endoprosthesis. The gold standard treatment among conventional procedures consists in performing the proximal and distal ligation of the popliteal artery above and below the aneurysm and bypassing it using an autologous saphenous vein graft. There are two approaches, medial and posterior, both of which have advantages and disadvantages. Mazzacaro et al. [12] did not find significant differences between these approaches, observing good results for both. Hoelting et al. [15] describe the benefits of using urokinase for preoperative fibrinolytic/thrombolytic therapy. In their study the incidence of amputations was 9% for patients who were treated with urokinase and 25% for those who only received surgery.

According to Rabellino et al. [14], endovascular treatment is a first choice alternative in patients with high cardiovascular risk and anatomically favorable conditions. In his work, he and his collaborators achieved technical success in 100% of the cases without complications during the first 30 days after surgery. The mean follow-up length was 34 months, during which 3 occlusions were observed. Two of them required recanalization with fibrinolysis. Primary patency during follow-up was of 75%, and secondary patency was 92%.

Recently, Cervit et al. [15] evaluated 592 patients and concluded that endovascular repair surgery (figure 6) achieves markedly inferior results as compared to open surgery procedures, particularly on patients with acute arterial ischemia. Similar results were obtained by Dorigo et al. [16], supporting the claim that open surgery has better long-term results than endovascular surgery.

The incidence of amputations reported varies from author to author, ranging from 7% to 33%, with a mean value of 15% [8-16].



Image 6. Endovascular repair.

Conclusion

PPA is an uncommon condition, affecting 0.1% of the general population and up to 1% of males older than 65. It is important to take into account the role played by anatomical variations on the presentation, diagnosis and treatment of this condition. PPA occurs in individuals with multiple clinical antecedents, the most important of which are arterial hypertension and smoking. Its clinical manifestations vary, and the condition can be asymptomatic or cause chronic or acute ischemia. In patients with PPA, complications are caused mainly by thrombosis or embolism, although PPAs also produce clinically observable consequences as a result of peripheral compression. Surgical intervention is necessary in all cases, even those that are asymptomatic, due to the high incidence of complications. The preferred procedure is to perform the proximal and distal ligation of the aneurysm and bypassing it using an autologous saphenous vein graft. Prostheses can be used for bypassing, with good results. There are no significant differences between medial and posterior approach. Presurgical treatment with urokinase can improve results. Endovascular treatment is an option for patients whose high cardiovascular risk precludes conventional surgery, although caution is necessary when dealing with patients with acute arterial ischemia, on whom conventional procedures achieve better results. According to the literature, amputation (which is often the only option) is carried out in 7% to 33% of cases, with a mean of around 15%. As regards the choice of complementary methods, opinions vary; color Doppler ultrasound scans and magnetic resonance angiography are good options, although it could be argued that arteriography is the gold standard for the diagnosis of PPA. In our case, the course of action taken was adequate; the severity of the patient's clinical condition (which was a result of acute ischemia) prevented us from performing an emergency arteriography. Although unfortunately our patient underwent amputation, his clinical parameters returned to normal in a short time, without mortality.

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